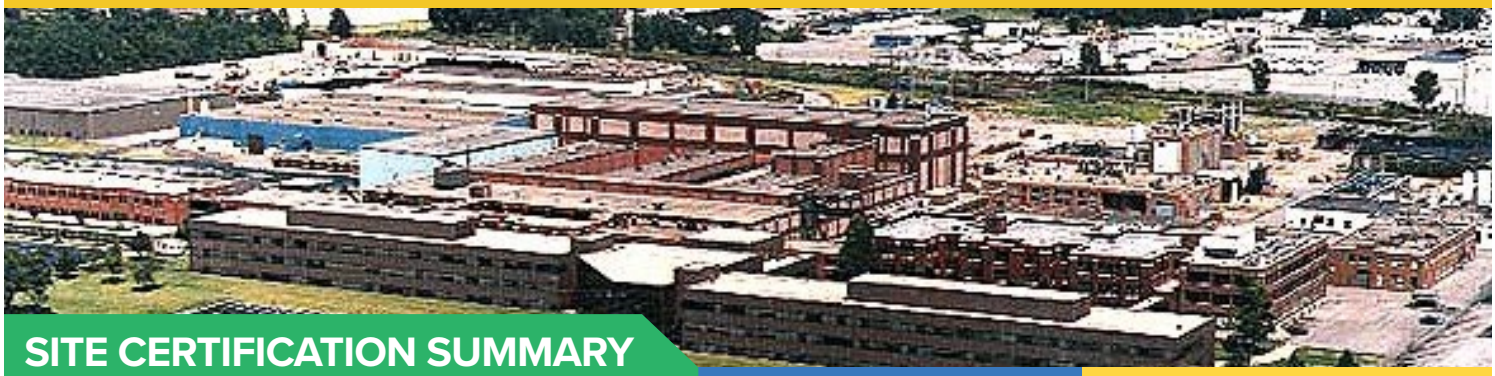
Tonawanda, New York, Site

U.S. DEPARTMENT OF ENERGY | Legacy Management



SITE CERTIFICATION SUMMARY

This Site Certification Summary provides information about the **Tonawanda, New York, Site**. The U.S. Department of Energy Office of Legacy Management is responsible for long-term stewardship of the site under the **Formerly Utilized Sites Remedial Action Program**.

Site Description and History

The Tonawanda, New York, Site (formerly known as the Linde Site) is located at 175 East Park Drive in Tonawanda, about 9 miles north of downtown Buffalo. Originally, Praxair, Inc. owned the 135-acre industrial facility. In November 2018, Praxair merged with the German-based Linde, keeping the former's name. Later research verified that the property owner was still listed as Praxair, Inc. as of January 28, 2019. Linde Air Products Division of Union Carbide processed uranium ores under contract with the Manhattan Engineer District between 1942 and 1946. These processing activities resulted in elevated levels of radionuclides in portions of the property and buildings. The site contaminants of concern (COCs) were radium-226 (Ra-226), thorium-230 (Th-230), and total uranium (U; U-234, U-235, and U-238). The current Praxair property contains office buildings, fabrication facilities, warehouse storage areas, material lay-down areas, and parking lots.

The Tonawanda site includes three Operable Units (OUs): Soils, Building 14, and Groundwater. Each OU had a separate Record of Decision (ROD) documenting the selected cleanup remedy.

Site Remediation Timeline

1976 — Oak Ridge National Laboratory conducted a radiological survey of the site. The survey found above-background levels of radioactivity in Building 38.

February 1980 — The U.S. Department of Energy (DOE) designated the site for remediation under the Formerly Utilized Sites Remedial Action Program (FUSRAP).

1993 — DOE completed a remedial investigation report, baseline risk assessment, feasibility study, and proposed plan for the remediation of the site.

1996 through 1997 — DOE conducted the first non-time-critical removal action (demolition of Building 38, excavation of contaminated soil next to Building 90, and decontamination of Buildings 14 and 31). DOE demolished Building 38 to prevent further deterioration that could have resulted in radioactivity from the building materials.

October 13, 1997 — Congress transferred administration and execution of FUSRAP cleanups from the DOE to the U.S. Army Corps of Engineers (USACE).

1998 through 1999 — USACE conducted the second non-time-critical removal action (demolition of Building 30).

March 3, 2000 — USACE issued the Soils OU ROD for the remediation of residual radioactive material in soil and on surfaces of buildings and infrastructure (with the exception of Building 14).

April 10, 2003 — USACE issued the Building 14 OU ROD, which included demolishing Building 14 and removing the debris from the site.

2004 through 2005 — USACE demolished Building 14.

December 2006 — USACE issued the Groundwater OU ROD, stating that no action was warranted.

August 2010 — USACE issued a Five-Year Review report for the Soils OU. The Five-Year Review process expected the Soils OU remedy to be protective of human health and the environment upon completion.

March 2015 — USACE completed the Site Closeout Report for the Linde FUSRAP Site.

Remedial Action

Various contractors, on behalf of DOE and USACE, conducted fieldwork for two non-time-critical removal actions and three phases of remedial action at the Tonawanda site between 1996 and 2013. The three phases of remedial action were Soils OU (1999-2010), Building 14 OU (2004-2005), and Soils OU (2010-2013). About 219,500 cubic yards of soil were excavated and shipped during the five removal and remedial actions. Soil samples and gamma walkover surveys were used to evaluate Final Status Survey (FSS) units.

The remedial action objectives for the Soils and Building 14 OUs at the Tonawanda Site were:

1. Remove soils exceeding the 40 Code of Federal Regulations (CFR) 192 standards for radium, which includes consideration of thorium when averaged over 100 square meters (m^2).
2. Remove soils with residual radionuclide concentrations within a 100-m^2 area that result in exceeding unity for the sum of ratios (SOR) of Ra-226, Th-230, and total U concentrations to the associated concentration limits, above background:
   - For surface cleanups, the concentration limits were:
     - 5 picocuries per gram (pCi/g) for Ra-226.
     - 14 pCi/g for Th-230.
     - 554 pCi/g for total U.
   - For subsurface cleanups, the concentrations limits were:
     - 15 pCi/g for Ra-226.
     - 44 pCi/g for Th-230.
     - 3,021 pCi/g for total U.
3. Remove residual radioactive materials from building and structure surfaces necessary to meet the benchmark dose for surfaces of 8.8 millirems per year (mrem/yr) based on the specific location of the surfaces and exposure scenarios.
4. Remediate the site to ensure that no concentration of total U exceeding 600 pCi/g above background would remain in the site soils.
5. Remove Building 14 so that no contaminated occupied or habitable building remains.

See the Fact Sheet or the Site Closeout Report for details of remedial action.

Looking north at the concrete pad where Building 30 once stood (January 2010).

Post-Remediation Sampling

Residual-Dose Assessment Summary

Argonne National Laboratory conducted a third-party, post-remediation radiological-dose assessment using residual concentrations of FUSRAP-eligible COCs (i.e., Ra-226, Th-230, and total U) in soil to determine the potential radiation dose to the critical group (i.e., a commercial/industrial worker) at the Tonawanda site. The gross sitewide average residual Ra-226, Th-230, and total U concentrations in soil were all below average background concentrations, which are reported in Table 7 on the Site Certification Data Summary Worksheet on pages 4-5. The residual dose to a commercial/industrial worker (2.02 mrem), including contribution from background, did not exceed the surface or subsurface benchmark dose of 8.8 mrem/yr and 4.1 mrem/yr, respectively, as specified in the ROD.

Final Status Survey Summary (1999-2010)

From 1999 through 2010, Shaw, a contractor, performed remediation and FSS activities for soils and structures at the site. Shaw was responsible for evaluating 116 FSS units from the Soils OU. The sitewide average residual Ra-226, Th-230, and total U concentrations in soil were 1, 1.38, and 3.09 pCi/g, respectively; and no individual FSS sample exhibited a derived concentration guideline level (DCGL) SOR score greater than 1. The results confirmed that these 116 FSS units met ROD criteria.

Final Status Survey Summary (2004-2005)

From 2004 through 2005, Shaw performed remediation and FSS activities on Building 14 structure surfaces and underlying soils. Shaw was responsible for evaluating five FSS units from the Building 14 OU. The sitewide average residual Ra-226, Th-230, and total U concentrations in soil were 1.16, 1.17, and 7.18 pCi/g, respectively; and no individual FSS sample exhibited a DCGL SOR score greater than 1. The results confirmed that these five FSS units met ROD criteria.

Final Status Survey Summary (2010-2013)

From 2010 through 2013, Cabrera, another contractor, continued remediation and FSS activities for the Soil OU. Cabrera was responsible for evaluating 16 FSS units. The sitewide average residual Ra-226, Th-230, and total U concentrations in soil were 0.79, 1.02, and 2.17 pCi/g, respectively; and no individual FSS sample exhibited a DCGL SOR score greater than 1, except one characterization sample on the CSX property in FSS unit 111. To determine whether the FSS unit 111 met ROD criteria, Cabrera examined the 100-m^2 area surrounding the elevated sample. Because the average SOR within this 100-m^2 area was below 1.0 (it was 0.46), ROD criteria were met in this area.

For more detailed results of the post-remediation sampling, see the Site Certification Data Summary Worksheet. For a more detailed map of the site and sampling locations, see the Site Overview Map on page 6.

Current Site Conditions

The USACE Site Closeout Report states that the implemented remedies "achieved the degree of cleanup and protection specified in the RODs for the Linde Site for all pathways of exposure." No further response is needed to protect human health and the environment from the FUSRAP-eligible COCs. All ROD remedial action goals have been achieved, and all applicable or relevant and appropriate requirements have been met for the site. Since FUSRAP-eligible residual radiological concentrations remaining at the Linde Site allow for unlimited use and unrestricted exposure, no five-year reviews, land use controls, or operations and maintenance are required to maintain the protectiveness of the implemented remedies.

While no land use restrictions are required, USACE determined future land use of the site to be commercial/industrial. Annually, LM verifies that land use at the site and surrounding properties (including the CSX property) remains industrial, as: (1) the future land use at the site was determined to be industrial, (2) the dose assessment was performed for a commercial/industrial worker rather than a resident, and (3) zoning in the area does not specifically forbid residential use.

In 2017, USACE transferred responsibility for long-term stewardship of the Tonawanda site to the DOE Office of Legacy Management (LM). The stewardship requirements and protocols are captured in the Long-Term Stewardship Plan for Completed FUSRAP Sites, which is available on the DOE Office of Legacy Management website (www.energy.gov/lm/tonawanda-new-york-site).

ADDITIONAL INFORMATION

Documents related to FUSRAP activities at the Tonawanda, New York, Site are available on the LM website at lmpublicsearch.lm.doe.gov/SitePages/default.aspx?sitename=Tonawanda.

For other information on site history or current long-term stewardship activities, please contact us at:

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Tonawanda, New York, Site Certification Data Summary Worksheet

Three tables in the Tonawanda Site Closeout Report provide evidence used to certify the site as clean.

When the tables refer to the "Site Closeout Report," that is the "Site Closeout Report for the Linde FUSRAP Site, Tonawanda, New York" (dated March 2015).

Results Summary for Class 1, 2, and 3 Final Status Survey Units

Table 10 in the Site Closeout Report (page 54)

FSS Unit	Number of FSS Samples	Ra-226[a,b] (pCi/g)			Th-230[a,b] (pCi/g)			Total U[a,b] (pCi/g)			Average SOR DCGL[b]	Surface β/ min/100cm²[c]
		MIN	AVG	MAX	MIN	AVG	MAX	MIN	AVG	MAX		
001	6	0.18	0.27	0.51	0.68	1.11	1.37	1.44	1.95	2.90	0.05	---
002c	10	0.11	0.43	1.43	1.06	2.49	7.42	1.54	5.87	22.07	0.09	---
003	16	0.17	0.39	0.66	1.54	2.56	3.36	2.77	6.17	18.88	0.09	---
004	20	0.69	1.10	1.47	0.58	1.13	1.62	1.06	1.13	2.56	0.10	---
005	20	0.21	0.39	0.74	0.86	1.65	4.35	1.23	3.54	13.11	0.07	---
005A	---	---	n/a	---	---	n/a	---	---	n/a	---	---	265.0
005B-F	---	---	n/a	---	---	n/a	---	---	n/a	---	---	-23.2
006	20	0.20	0.49	1.13	1.01	1.65	3.42	1.18	6.66	41.31	0.07	---
007	20	0.23	0.58	1.06	1.06	1.29	1.83	1.61	3.33	9.49	0.07	---
008	20	0.11	0.82	1.86	1.15	1.74	3.38	1.99	3.77	10.42	0.10	---
009	20	0.36	0.83	1.56	0.27	1.74	3.20	0.70	4.51	10.08	0.10	---
010	20	0.22	0.69	1.88	1.31	2.03	9.50	1.42	3.89	12.11	0.09	---
011	16	0.12	0.72	1.31	0.82	1.87	7.94	1.54	4.31	12.83	0.09	---
011A, 014A-Bd	---	---	n/a	---	---	n/a	---	---	n/a	---	---	614.0
012	19	0.18	0.63	3.68	0.91	1.39	3.32	2.22	6.95	30.04	0.08	---
013	20	0.14	0.37	0.94	1.02	1.35	1.73	1.67	4.14	32.83	0.06	---
014	10	0.28	0.65	1.71	1.08	1.52	1.84	1.65	2.49	5.12	0.08	---
015	20	0.16	1.38	4.10	0.68	1.84	3.09	1.96	9.32	91.78	0.14	---
016	20	0.89	1.62	3.95	0.93	1.39	1.80	1.69	2.40	4.06	0.14	---
016A	---	---	n/a	---	---	n/a	---	---	n/a	---	---	143.0
017	20	0.75	1.32	1.63	0.95	1.21	1.35	0.82	2.01	2.81	0.12	---
017B-C	---	---	n/a	---	---	n/a	---	---	n/a	---	---	135.0
018	17	0.15	0.33	0.49	0.71	1.22	1.59	1.59	4.92	40.02	0.05	---
019	20	0.33	0.92	1.26	0.55	1.07	1.70	1.12	3.36	23.68	0.09	---
020	6	0.56	0.83	1.20	0.94	1.30	2.18	1.22	1.92	2.52	0.09	---
021	20	0.21	0.52	1.16	0.91	1.99	3.75	1.42	3.19	5.79	0.09	---
022	20	0.19	0.46	1.10	1.04	2.56	5.23	1.61	4.44	8.96	0.09	---
023	10	0.79	1.12	2.07	1.07	1.48	2.43	1.79	3.95	10.95	0.11	---
024	20	0.23	1.09	1.82	0.65	1.19	1.79	1.33	2.03	3.76	0.10	---
025	20	0.68	1.84	3.21	1.01	2.09	3.52	1.51	4.55	9.09	0.17	---
026	14	0.66	1.19	2.15	0.65	1.28	2.03	1.14	2.09	5.03	0.11	---
027	20	0.44	1.00	1.55	0.63	1.11	1.50	1.14	1.88	2.98	0.09	---
028	19	0.63	1.06	1.52	0.85	1.33	2.47	1.07	2.66	16.36	0.10	---
028A	---	---	n/a	---	---	n/a	---	---	n/a	---	---	-63.0
029	19	0.71	1.32	1.91	1.15	1.63	2.19	1.46	2.22	3.51	0.13	---
030	10	0.70	1.24	1.97	1.04	1.66	2.71	1.20	2.37	3.62	0.12	---
030A	---	---	n/a	---	---	n/a	---	---	n/a	---	---	56.0
031	6	0.85	1.14	1.47	0.83	1.27	1.76	0.69	1.82	2.28	0.11	---
032	10	0.65	1.27	1.80	1.12	1.37	1.58	1.52	1.97	2.62	0.12	---
033	7	0.60	0.80	1.13	0.77	1.21	1.89	0.70	1.33	1.81	0.08	---
033A	---	---	n/a	---	---	n/a	---	---	n/a	---	---	-16.0
034	17	0.65	1.14	1.88	0.48	1.38	3.43	0.60	2.03	6.30	0.11	---
035	17	0.52	1.01	2.23	0.52	1.13	2.96	1.08	2.45	11.37	0.09	---
036	6	0.67	1.37	2.49	1.14	2.38	4.99	0.66	2.45	4.10	0.15	---
037	17	0.54	0.96	1.69	1.19	1.61	2.10	1.29	1.75	2.37	0.10	---
038	12	0.61	0.91	1.28	0.78	1.10	1.44	1.22	1.97	3.40	0.09	---
039	14	0.64	0.93	1.17	0.82	1.21	1.56	1.47	2.01	3.51	0.09	---
040	18	0.56	0.90	1.44	0.77	1.32	1.92	1.49	3.78	22.41	0.09	---
041	11	0.86	1.20	1.77	0.85	1.21	1.77	0.42	3.00	15.62	0.11	---
042	20	0.60	1.04	1.82	0.35	1.13	2.15	1.38	1.95	3.17	0.10	---
043	4	0.74	0.92	1.04	0.55	1.17	1.49	1.62	2.03	2.83	0.09	---
044	10	0.66	1.08	1.71	0.96	1.27	1.48	1.36	2.24	4.10	0.10	---
045	19	0.60	1.22	2.28	0.70	1.37	3.41	1.14	3.28	16.51	0.11	---
046	10	0.69	0.94	1.45	0.56	1.13	1.65	1.50	1.88	2.26	0.11	---
047	13	0.62	0.95	1.33	0.73	1.10	1.79	1.04	2.01	3.72	0.09	---
048	10	0.07	0.64	1.22	0.55	0.96	1.34	0.80	1.88	2.81	0.06	---
049	15	-0.04	0.73	1.33	0.80	1.10	1.59	1.59	2.68	8.96	0.08	---
049A	---	---	n/a	--	---	n/a	---	---	n/a	---	---	186.0
050	7	-0.01	0.38	0.82	0.66	0.85	1.10	1.03	1.82	2.58	0.05	---
051	16	0.05	0.82	1.34	0.57	0.89	1.30	1.14	1.64	2.14	0.07	---
052	9	0.00	0.87	2.74	0.57	1.24	3.03	1.28	3.53	16.47	0.09	---
053	6	0.64	0.87	1.14	0.71	0.94	1.35	1.25	2.40	5.94	0.08	---
054	6	0.36	0.90	2.60	0.37	1.44	4.30	0.36	3.68	12.43	0.10	---
055	6	0.38	0.78	1.07	0.54	1.09	1.71	1.27	2.30	5.62	0.08	---
056	11	0.65	1.00	1.65	0.66	1.18	1.99	0.67	2.81	3.31	0.09	---
057	15	0.36	1.08	1.49	0.61	1.02	1.52	1.05	1.97	2.54	0.09	---
058	10	0.47	0.97	1.37	0.59	0.91	1.24	1.24	1.71	2.41	0.08	---
059	13	0.38	0.92	1.40	0.70	0.94	1.31	1.03	1.54	2.75	0.08	---
060	13	0.77	1.17	2.11	0.64	1.02	1.38	1.14	2.11	5.46	0.10	---
060A-B	---	---	n/a	---	---	n/a	---	---	n/a	---	---	206.0
061	13	0.42	0.99	1.37	0.78	1.01	1.34	1.21	2.01	3.76	0.09	---
062	16	0.68	1.03	1.37	0.54	1.22	4.86	1.19	1.84	2.88	0.10	---
063	20	0.78	1.22	2.67	0.38	1.17	2.48	0.76	2.41	7.78	0.11	---
064	16	0.62	1.10	1.91	0.51	0.94	1.49	0.63	1.71	3.76	0.10	---
065	6	1.01	1.42	1.78	0.79	1.28	2.10	1.69	3.17	6.87	0.13	---
066	16	0.82	1.50	4.02	0.70	1.10	1.53	0.92	1.97	2.88	0.12	---
067	6	0.74	1.00	1.27	0.32	0.94	1.80	0.98	2.92	6.89	0.09	---
068	6	0.61	1.30	1.85	0.63	3.02	11.40	1.58	11.10	18.60	0.16	---
069	10	0.96	1.32	1.80	0.94	1.80	2.57	0.73	2.50	4.10	0.13	---
070	15	0.37	1.28	2.38	0.98	1.60	3.38	1.29	2.81	4.46	0.13	---
071	6	0.72	1.24	1.94	0.92	1.67	4.50	1.44	1.86	2.62	0.12	---
071A, B, and Cd	---	---	n/a	---	---	n/a	---	---	n/a	---	---	125.8
072	11	0.71	1.14	1.70	0.84	1.70	5.32	1.44	3.78	16.53	0.12	---
073	11	0.85	1.19	1.95	0.92	1.23	1.84	1.28	2.01	2.75	0.11	---
074	17	0.25	1.15	1.75	0.13	1.02	1.70	0.48	2.14	6.93	0.10	---
075	6	0.99	1.39	2.45	0.45	1.15	2.55	1.16	3.76	13.72	0.12	---
076	6	0.91	1.17	1.55	0.74	1.05	1.22	0.93	2.11	2.83	0.10	---
077	7	0.59	1.64	4.05	0.93	1.32	1.74	1.61	2.14	2.81	0.14	---
078	11	0.72	1.25	1.93	0.45	1.08	2.76	0.93	2.20	8.63	0.11	---
079	6	0.72	1.23	1.57	0.52	0.97	1.27	1.54	2.07	2.60	0.11	---
080	3	1.06	1.23	1.40	0.88	1.01	1.12	0.73	1.63	2.37	0.10	---
080A	---	---	n/a	---	---	n/a	---	---	n/a	---	---	356.5
081	9	0.58	1.32	3.42	0.48	1.40	4.64	0.47	3.06	10.68	0.12	---
082	13	0.32	1.34	1.96	0.65	1.09	1.70	1.53	2.15	3.42	0.12	---
082C-D	---	---	n/a	---	---	n/a	---	---	n/a	---	---	794.0
082A, B, and E	---	---	n/a	---	---	n/a	---	---	n/a	---	---	185.5
083	10	0.39	0.85	1.79	0.38	0.82	1.23	0.90	1.71	2.62	0.08	---
084	3	0.67	0.86	1.16	0.77	1.08	1.48	1.67	2.04	2.22	0.08	---
085	8	0.30	0.77	1.19	0.23	0.92	1.40	0.83	1.66	2.14	0.07	---
086	3	0.20	0.67	0.91	0.19	0.41	0.70	1.62	1.99	2.60	0.06	---
87Ac	---	---	n/a	---	---	n/a	---	---	n/a	---	---	852.0
088	10	0.52	1.01	1.99	0.56	1.06	1.74	1.19	5.13	29.81	0.09	---
089	10	0.00	1.22	2.51	0.82	1.69	3.57	1.69	6.36	22.83	0.12	---
090	20	0.37	0.88	1.41	0.73	1.50	2.91	0.75	2.48	4.65	0.09	---
091	20	0.27	1.13	2.78	0.23	1.44	2.27	0.63	2.70	7.06	0.11	---
092	20	0.57	1.19	2.09	0.84	1.42	2.19	1.41	2.76	13.68	0.11	---
093	15	0.60	0.99	1.45	0.76	1.21	1.87	1.16	2.30	7.89	0.09	---
094	20	0.48	0.89	1.65	0.67	1.25	4.18	0.31	1.92	5.20	0.09	---
095	14	0.36	1.03	4.40	0.51	1.13	2.30	1.01	2.52	7.59	0.10	---
096	19	0.24	0.80	1.47	0.33	0.10	1.90	0.93	3.00	15.33	0.07	---
097	6	0.58	0.64	0.84	0.52	0.76	1.06	0.89	1.59	2.05	0.06	---
098	6	0.68	0.90	1.19	0.51	0.78	1.07	1.02	1.80	2.81	0.08	---
099	7	0.58	1.14	3.10	0.52	1.22	1.93	1.19	2.67	5.16	0.11	---
100	13	0.59	0.78	0.96	0.54	1.01	1.74	1.16	1.87	2.96	0.08	---
101	17	0.47	1.38	2.72	0.71	1.64	2.99	1.63	3.78	5.90	0.14	---
102	18	0.18	0.91	3.82	0.44	1.74	1.41	0.99	1.74	2.49	0.08	---
103	10	0.78	1.31	2.18	0.76	1.58	2.21	1.10	3.71	6.72	0.13	---
104A	---	---	n/a	---	---	n/a	---	---	n/a	---	n/a	---
104	9	0.54	0.69	0.88	0.70	0.80	0.85	1.31	1.54	1.95	0.06	---
105	19	0.49	1.00	1.36	0.70	1.06	3.28	0.74	0.96	8.90	0.09	---
106	21	0.46	0.87	1.38	0.80	1.06	1.27	1.52	4.11	46.93	0.08	---
107	7	0.39	0.75	0.99	0.78	0.84	0.89	1.56	1.65	1.75	0.07	---
108	9	0.63	0.94	1.44	0.79	0.98	1.16	1.44	1.64	1.82	0.08	---
109	4	0.87	1.45	2.78	1.08	1.52	2.20	1.71	1.87	2.07	0.13	---
110	20	0.10	0.31	0.49	0.54	0.96	1.27	1.27	1.98	2.63	0.04	---
111	12	0.42	0.75	1.26	0.88	1.02	1.18	1.18	2.67	8.60	0.07	---
112	20	0.44	0.88	1.66	0.61	0.89	1.23	1.17	1.73	2.55	0.08	---
113	11	0.17	0.36	0.74	0.83	1.06	1.53	1.75	3.60	14.38	0.05	---
114	20	0.49	0.97	1.43	0.45	1.28	3.64	0.94	2.90	8.05	0.10	---
115	20	0.66	0.91	1.26	0.69	1.08	1.56	1.58	2.60	5.42	0.08	---
116	21	0.35	0.70	1.09	0.69	0.87	1.10	1.40	1.65	2.14	0.07	---
117	4	0.28	0.53	0.82	0.80	0.81	0.83	1.29	1.51	1.73	0.05	---
B-14-001	6	0.78	1.22	1.59	0.68	1.18	1.72	1.14	2.33	3.72	0.11	---
B-14-002	13	0.67	1.24	2.06	0.50	1.33	2.49	1.43	14.46	122.20	0.12	---
B-14-003	14	0.66	1.02	1.48	0.70	1.13	2.04	1.55	9.57	41.86	0.10	---
B-14-004	9	0.75	1.14	1.80	0.68	1.02	1.56	1.14	2.35	6.30	0.10	---
B-14-005	---	---	---	---	---	---	---	---	---	---	---	131.8

aThe average site background concentrations for Ra-226, Th-230, and total U were 1.1, 1.4, and 6.1 pCi/g, respectively.
bThe MIN, AVG, and MAX Ra-226, Th-230, and total U concentrations, and average SOR DCGL values, presented were not incremental to background (i.e. it conservatively included contribution from background).
cA FSS was performed by Shaw. A subsequent remediation and new FSS was completed by Cabrera and is documented in its associated TDP.
dFSS units are grouped together as presented in their TDP. However, they were counted as separate FSS units in the Project Construction Report (Shaw 2010).
eThe presented values meet derived surface contamination limits for each unit.
Note: Data presented in this table reflects that presented in TDPs. However, some information may not reflect current site conditions due to soil excavations conducted subsequent to the TDPs being issued. For example, Class 2 FSS unit number 002 was superseded by Class 1 FSS unit numbers 094 and 095 and two of the seven FSS samples for Class 1 FSS unit number 050 were later excavated and therefore, only five of the seven FSS samples for Class 1 FSS unit number 050 remain representative of current site conditions.

–continued to page 4–

–continued from page 3–

Tonawanda, New York, Site Certification Data Summary Worksheet

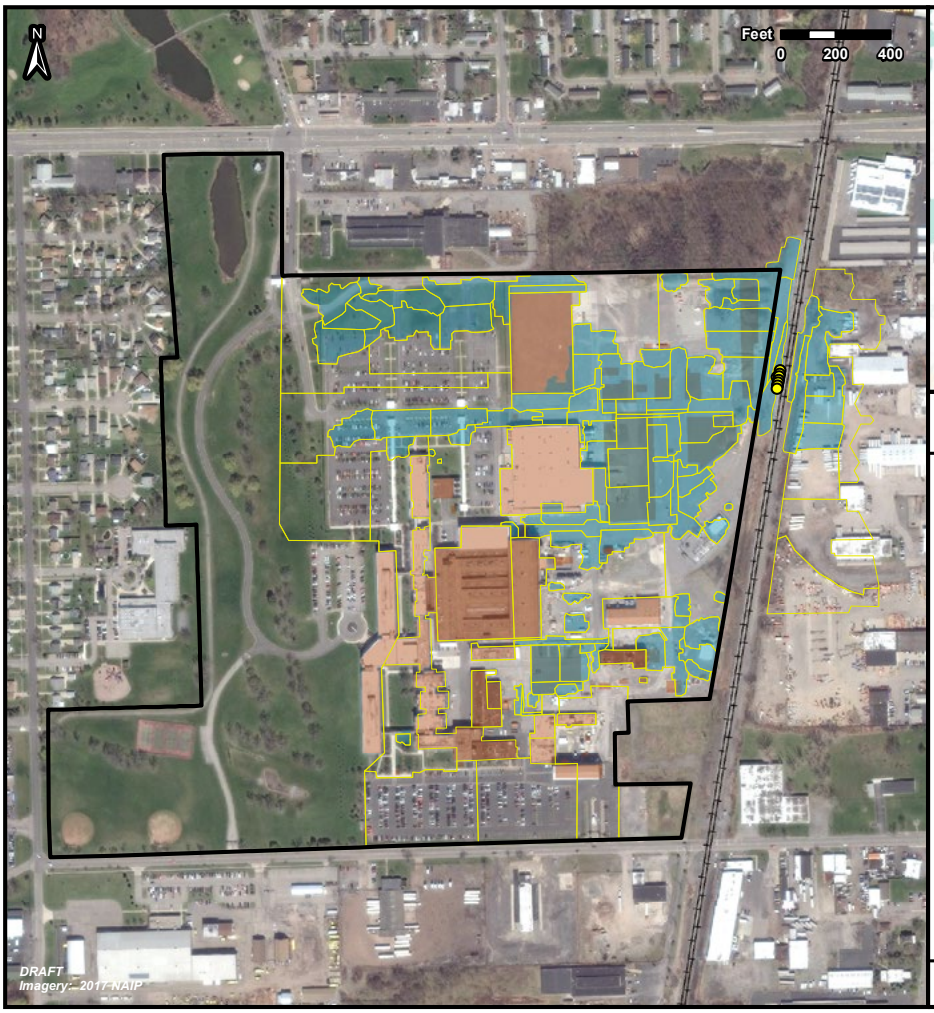
Sample Results from the CSX Rail Line				
Table 12 in the Site Closeout Report (page 60)				
Sample Location	**Ra-226[a] (pCi/g)**	**Th-230[a] (pCi/g)**	**Total U[a] (pCi/g)**	**Average SOR DCGL[b]**
L-SL-SC-4373	0.93	0.92	2.30	0.00
L-SL-SC-4374	3.00	0.73	3.35	0.11
L-SL-SC-4375	10.6	13.4	7.73	0.91
L-SL-SC-4376	11.1	9.2	5.38	0.85
L-SL-SC-4377	13.3	27.2	9.01	**1.41**
L-SL-SC-4378	9.3	18.3	8.07	0.94
L-SL-SC-4379	1.27	2.76	2.83	0.04
L-FS111-003	0.79	0.93	0.90	0.07
L-FS111-004	0.58	0.96	0.89	0.06
Average	5.66	8.27	4.50	0.46

[a]Results include contribution from background (i.e. background is not subtracted).
[b]Samples exceeding a SOR of 1 are bold.

Residual Soil Concentrations and Resultant Dose				
Table 7 in the Site Closeout Report (page 40)				
Linde FUSRAP Site	**Soil Concentrations (pCi/g)**			**Annual Residual Dose to Commercial/Industrial Worker (mrem)[b,c]**
	Ra-226	**Th-230**	**Total U[a]**	
Site-Wide Average Gross Residual Soil Concentrations	0.97	1.31	3.00	2.02
Average Site Background Concentrations[d]	1.1	1.4	6.1	-

[a]Total U is the sum of the uranium isotopes (i.e., U-234, U-235, and U-238).
[b]The resultant dose includes background.
[c]The resultant dose, including background, to a construction worker was 0.50 mrem/yr.
[d]Average site background concentrations (DOE 1993a).

Tonawanda, New York, Site Map



U.S. DEPARTMENT OF ENERGY
OFFICE OF LEGACY MANAGEMENT

Work Performed by
Navarro Research & Engineering, Inc.
Under DOE Contract Number DE-LM0000421

Tonawanda, NY, Site

- Sample Locations
- Final Status Survey Units
- Extent of Remedial Action
- Location of Buildings
- FUSRAP Site Boundary

DATE PREPARED:	FILE NAME:
October 15, 2019	TON

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